

Formation of a Tropopause Cirrus Layer Observed over Florida during CRYSTAL-FACE

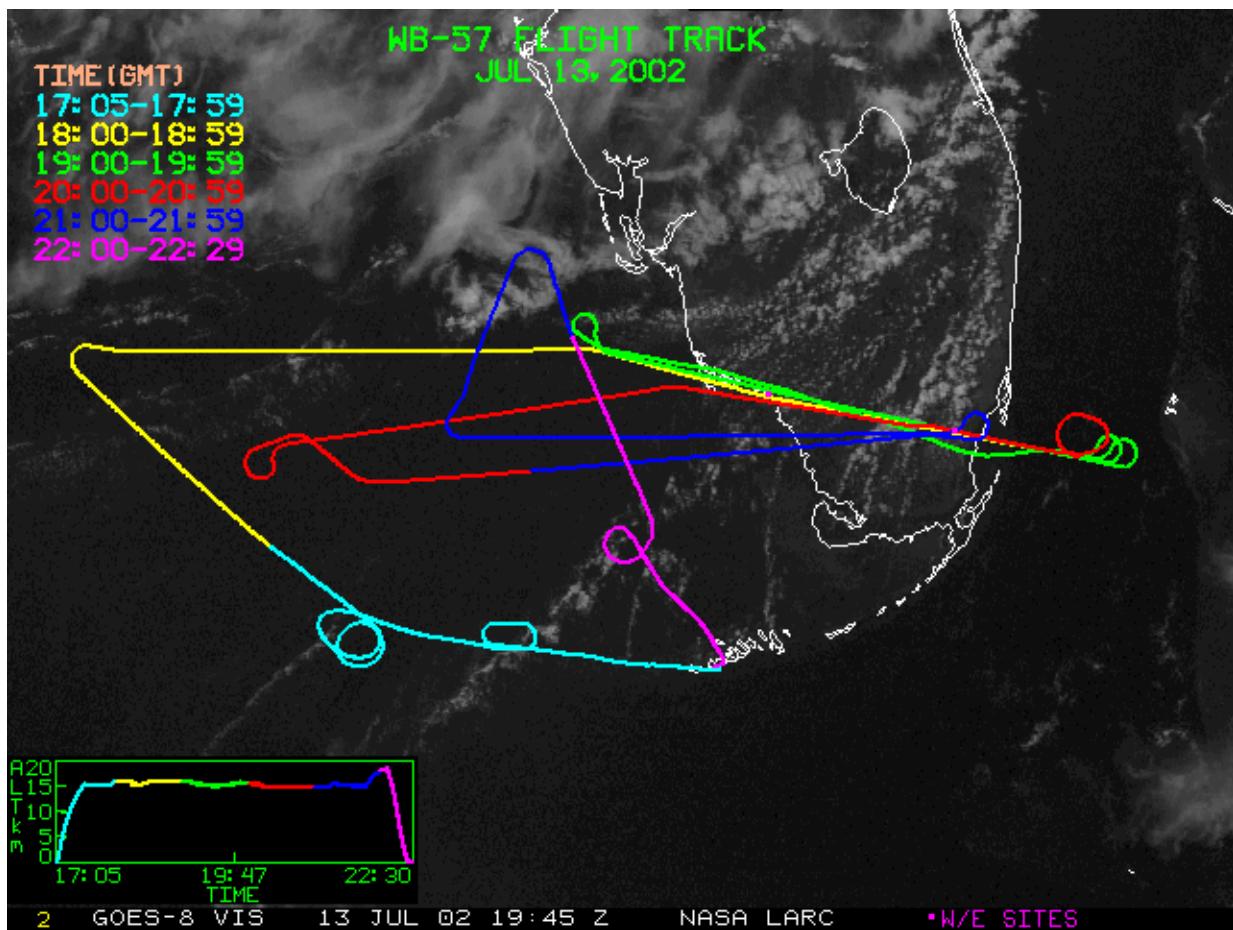
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NASA Ames Research Center

CRYSTAL-FACE instrument teams

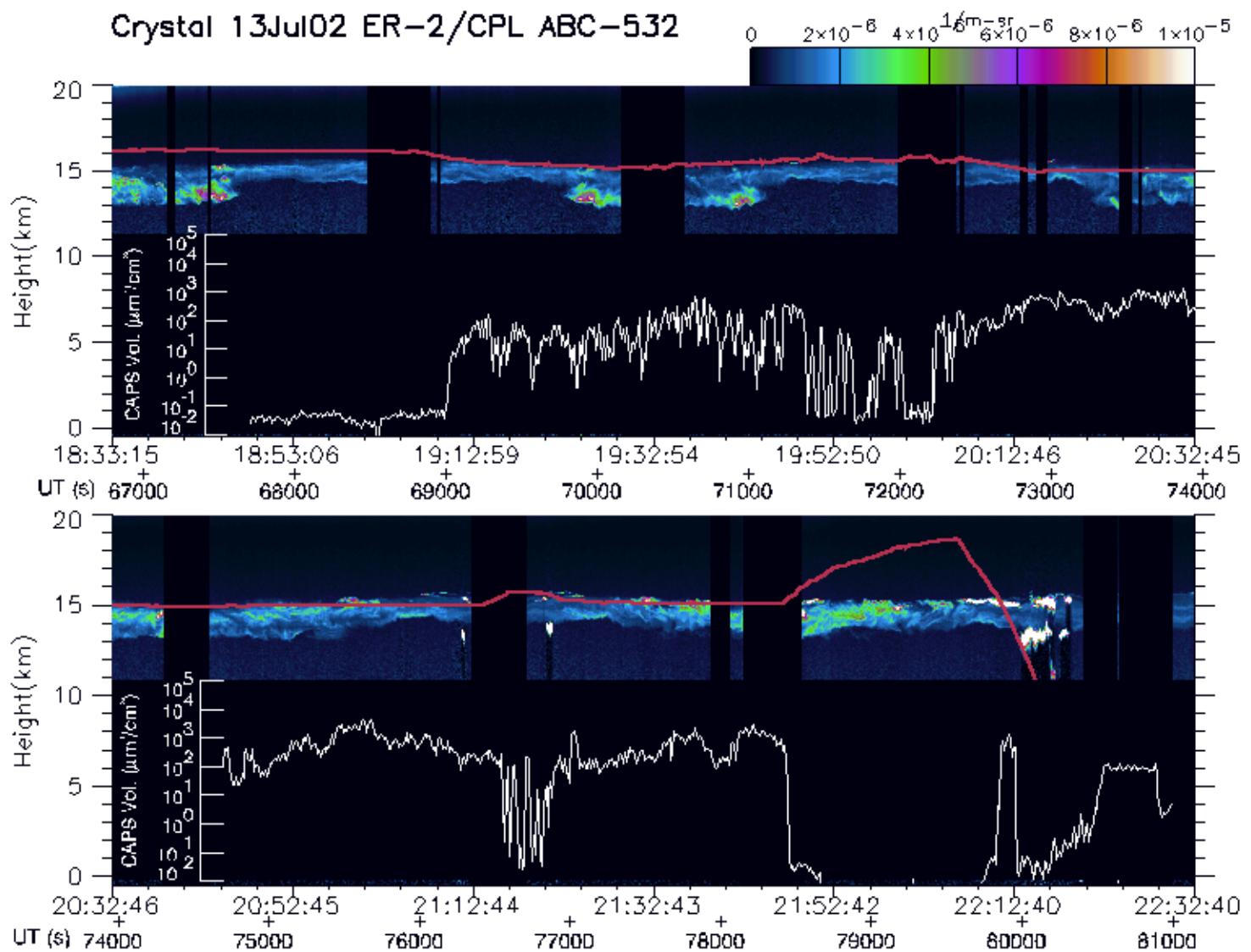
Outline:

- Measurements of cloud layer and environmental conditions
lidar, in situ T, S_{ice} , PSDs, T-prof, etc.
- Trajectory/cloud model preliminary results
- Summary and next steps

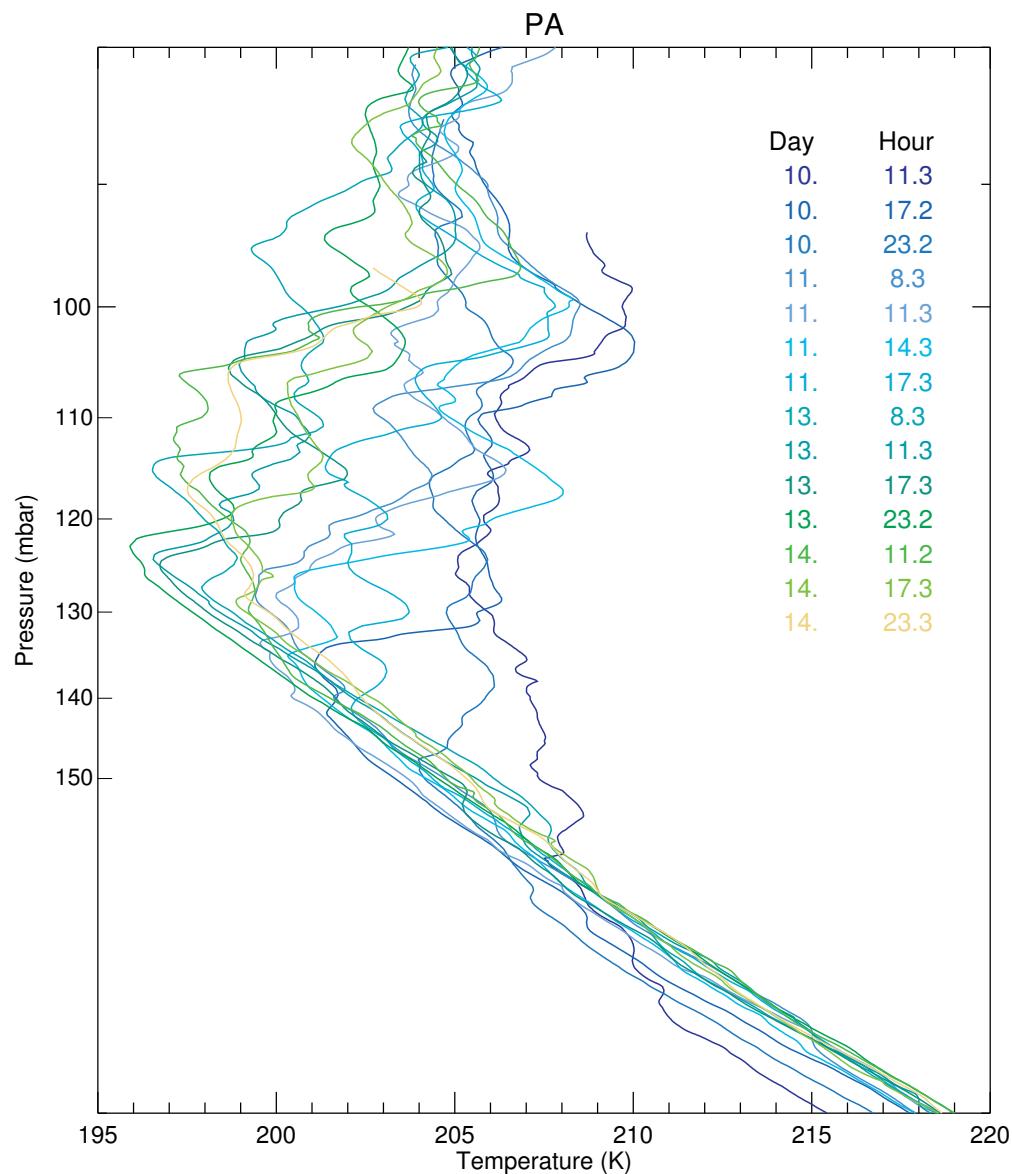
July 13 WB-57 Flight track



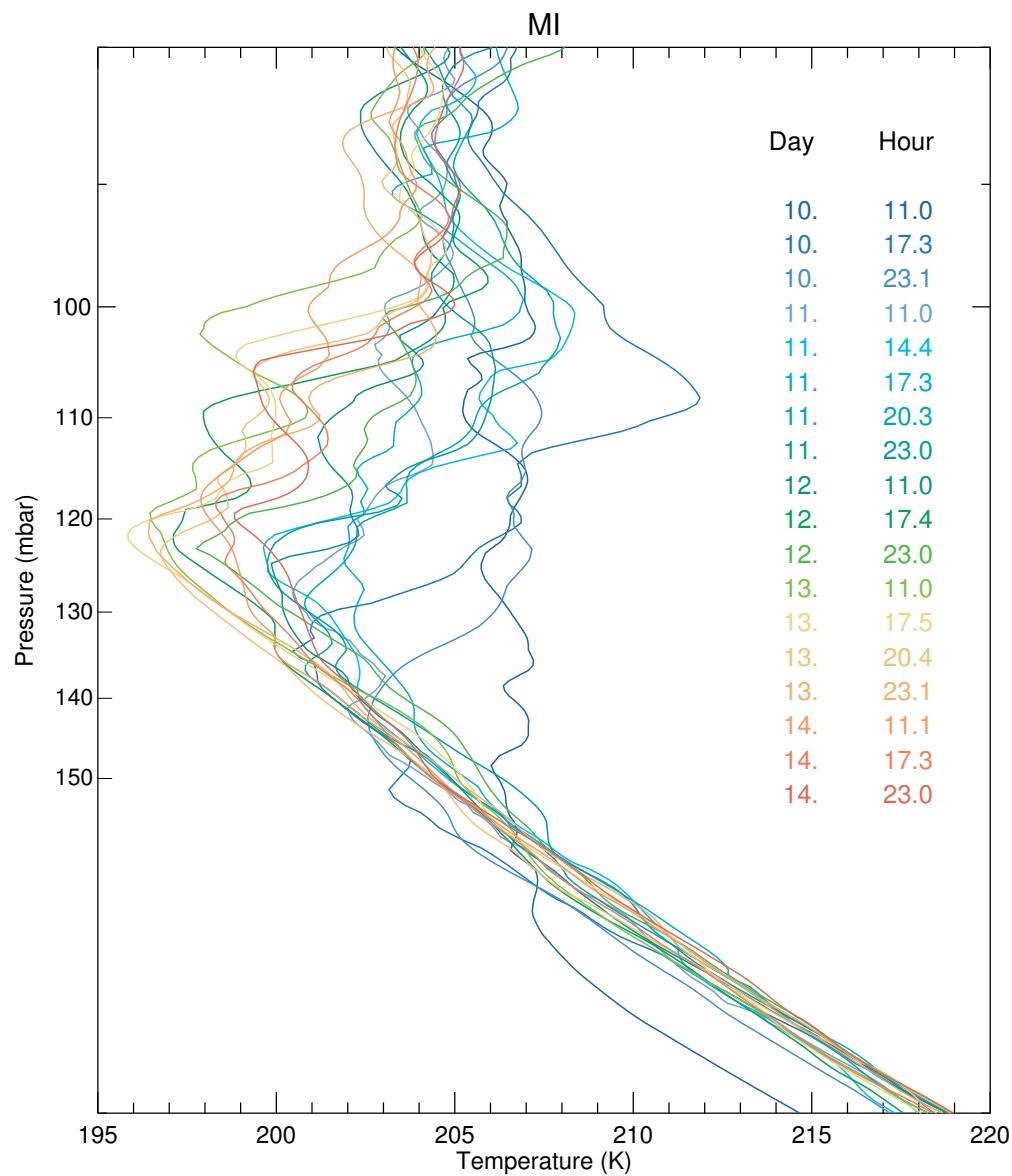
[McGill, Baumgardner]



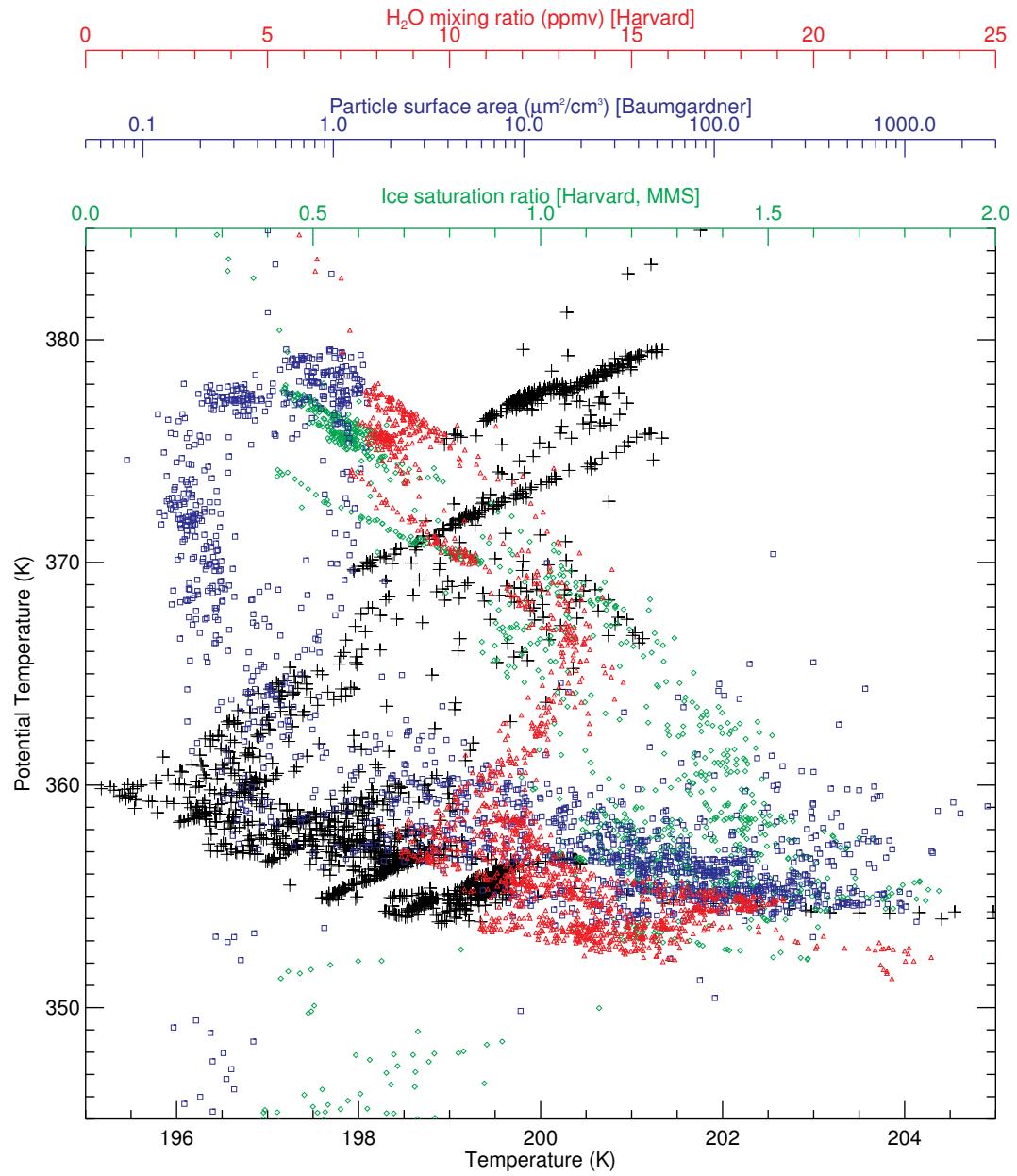
PARSL Soundings



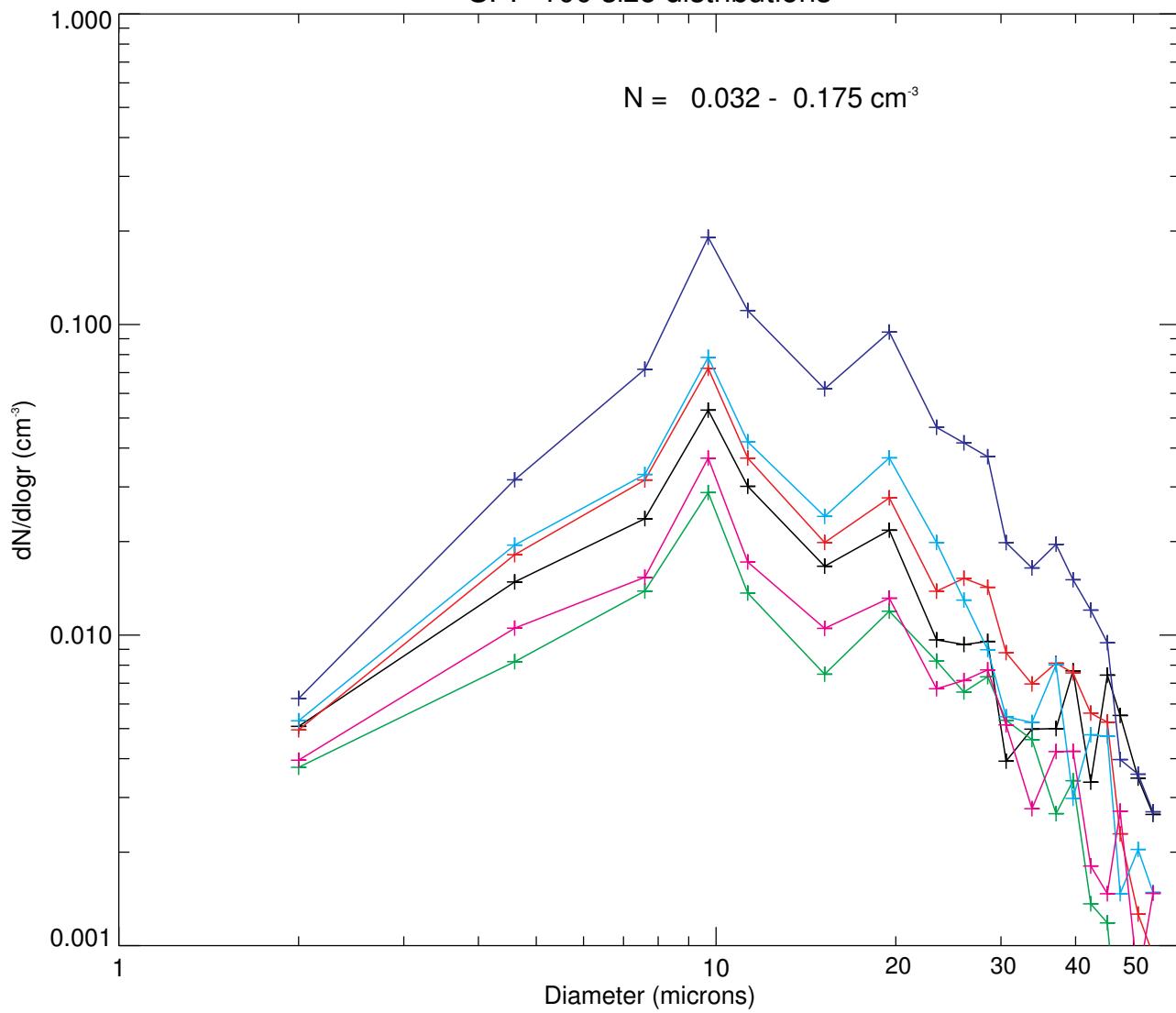
Miami Soundings

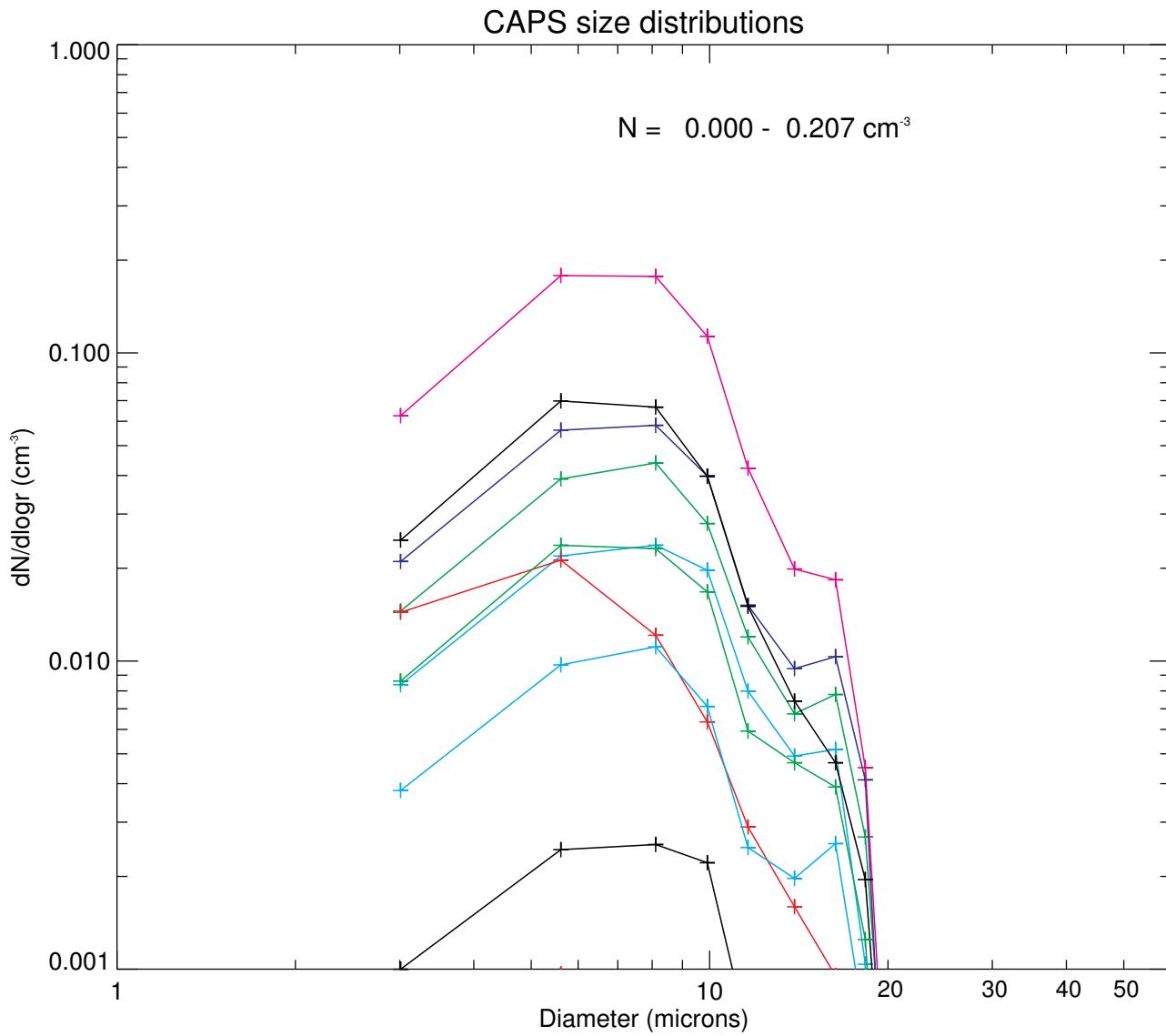


WB-57 In situ measurements

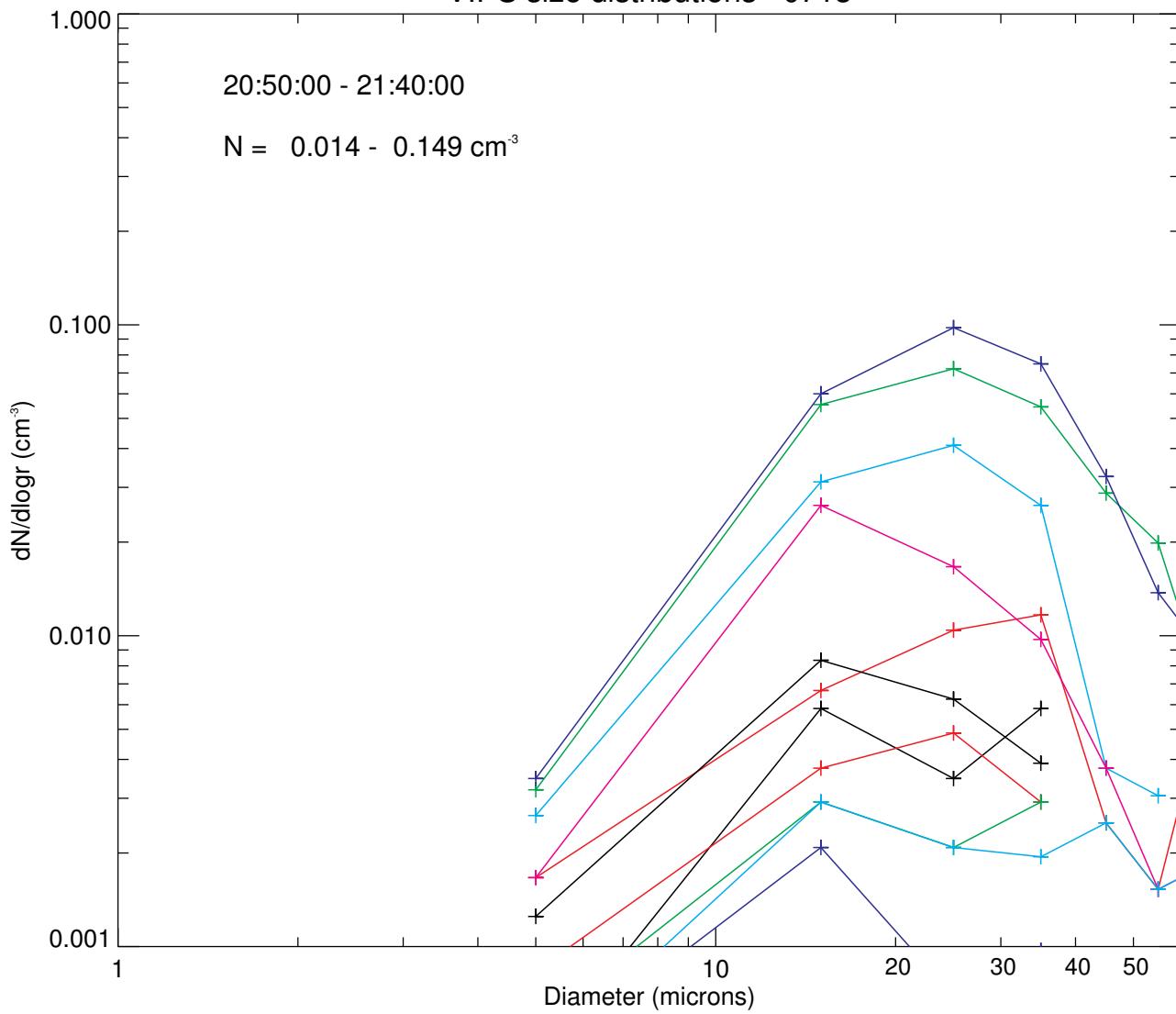


SPP-100 size distributions

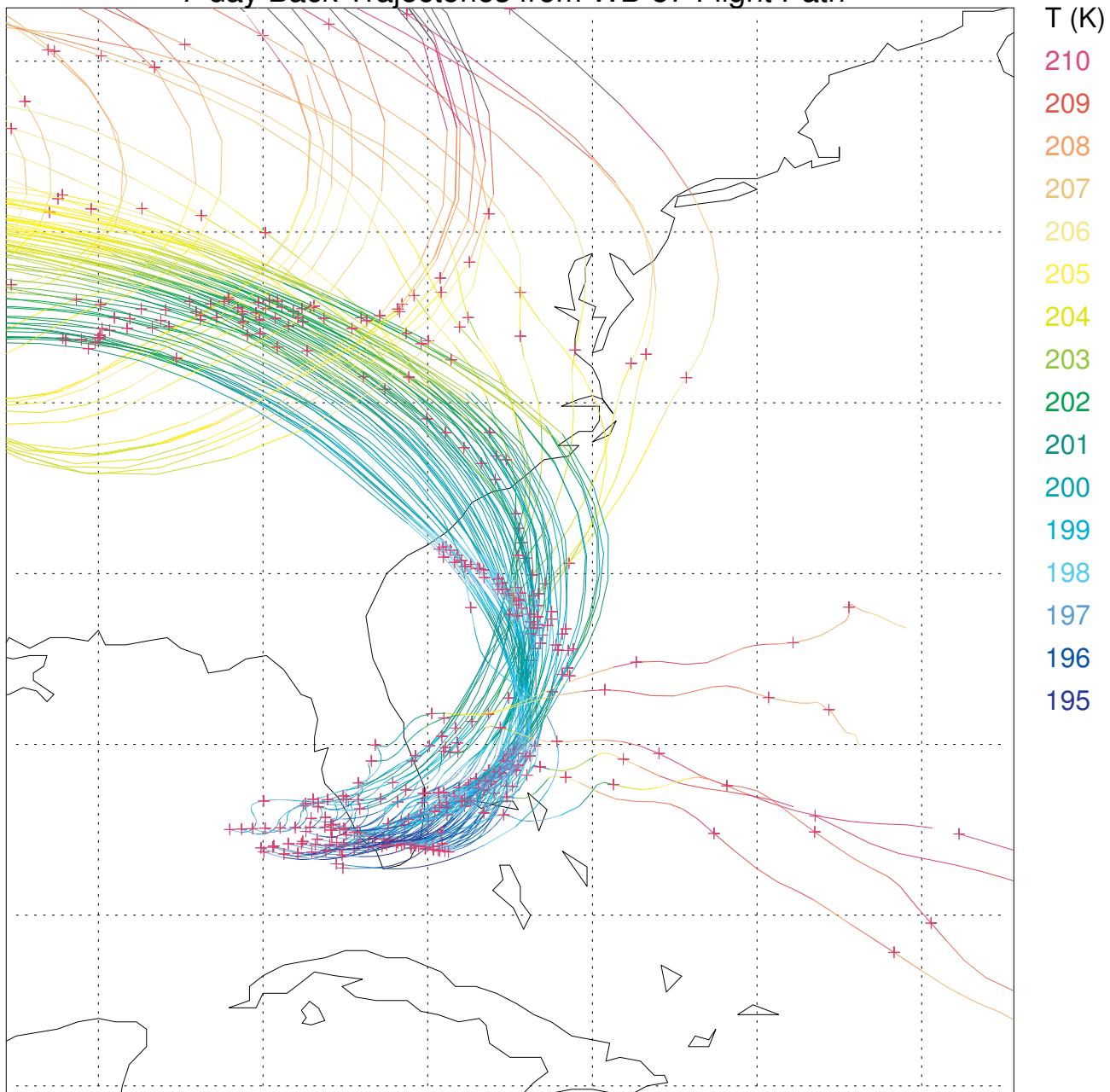


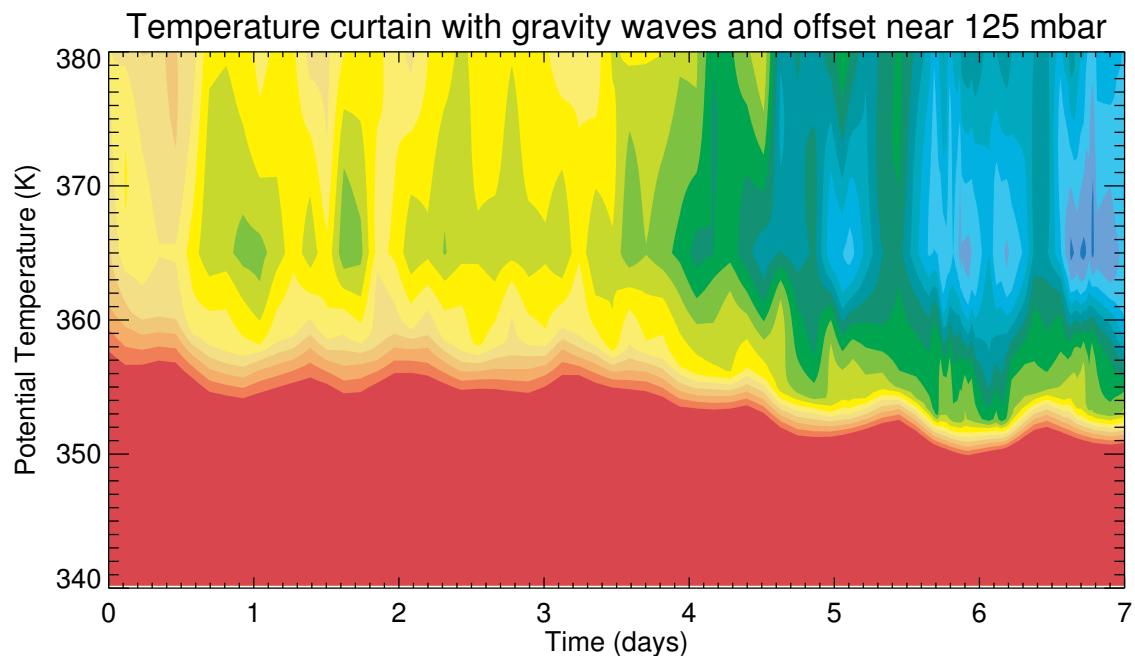
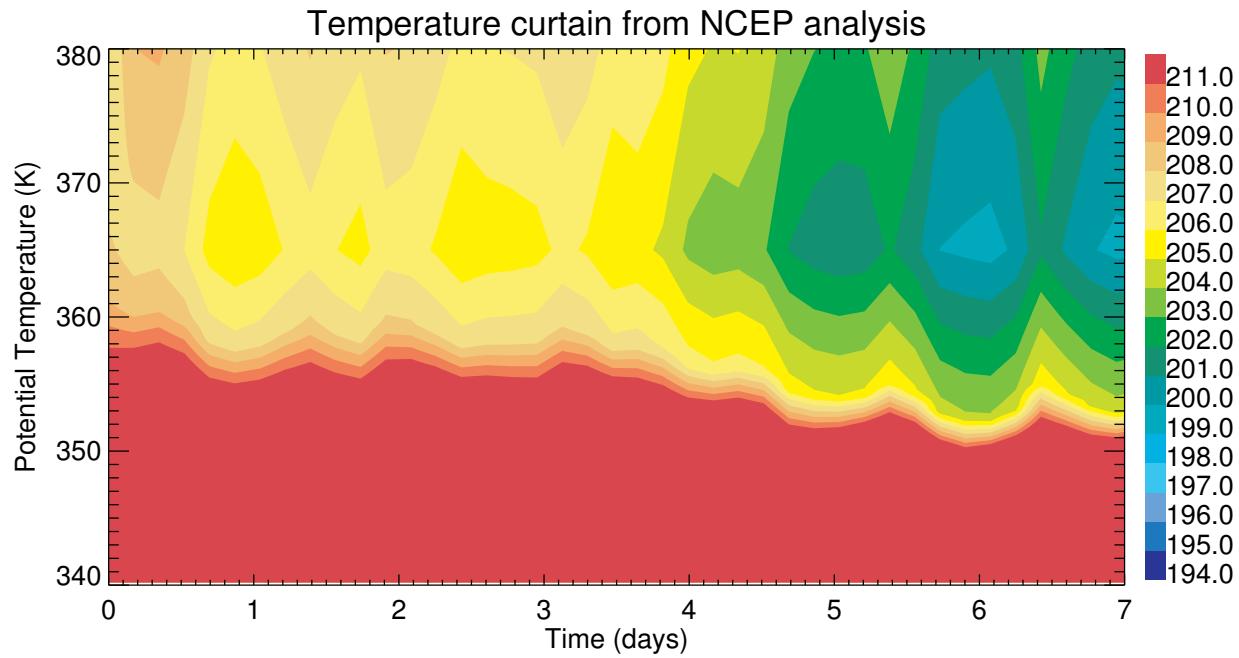


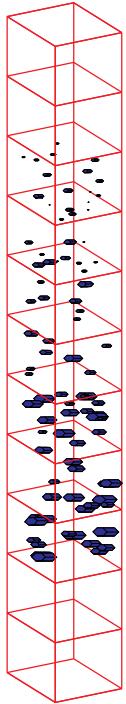
VIPS size distributions 0713



7-day Back Trajectories from WB-57 Flight Path

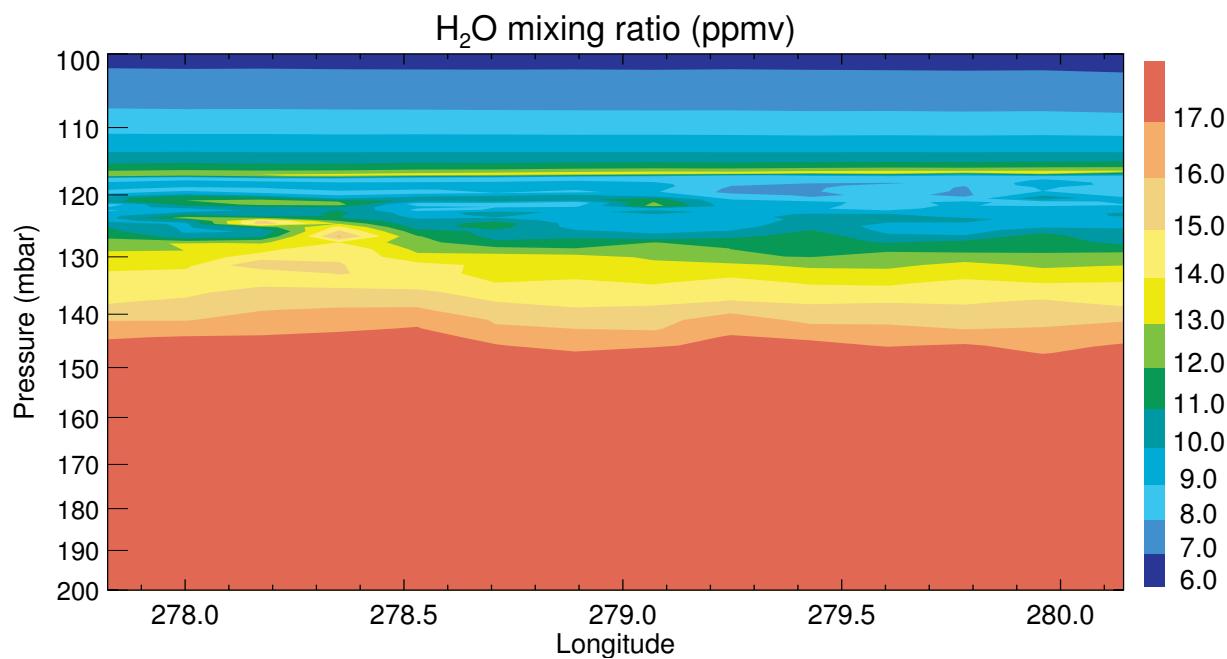
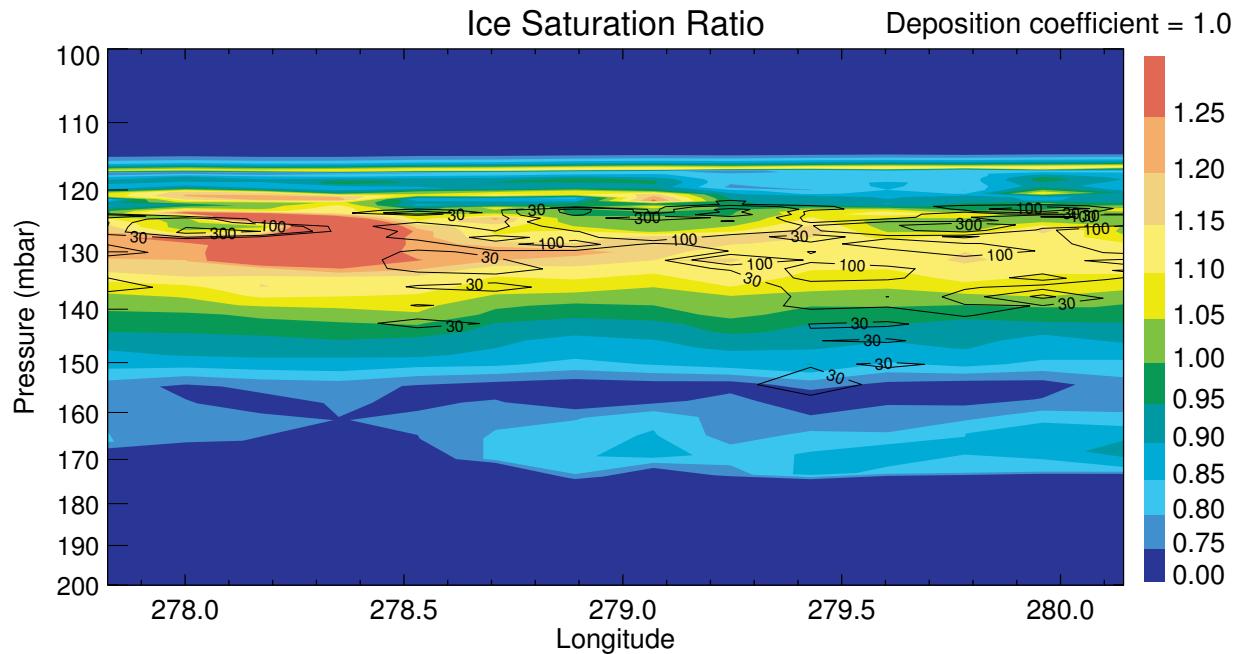




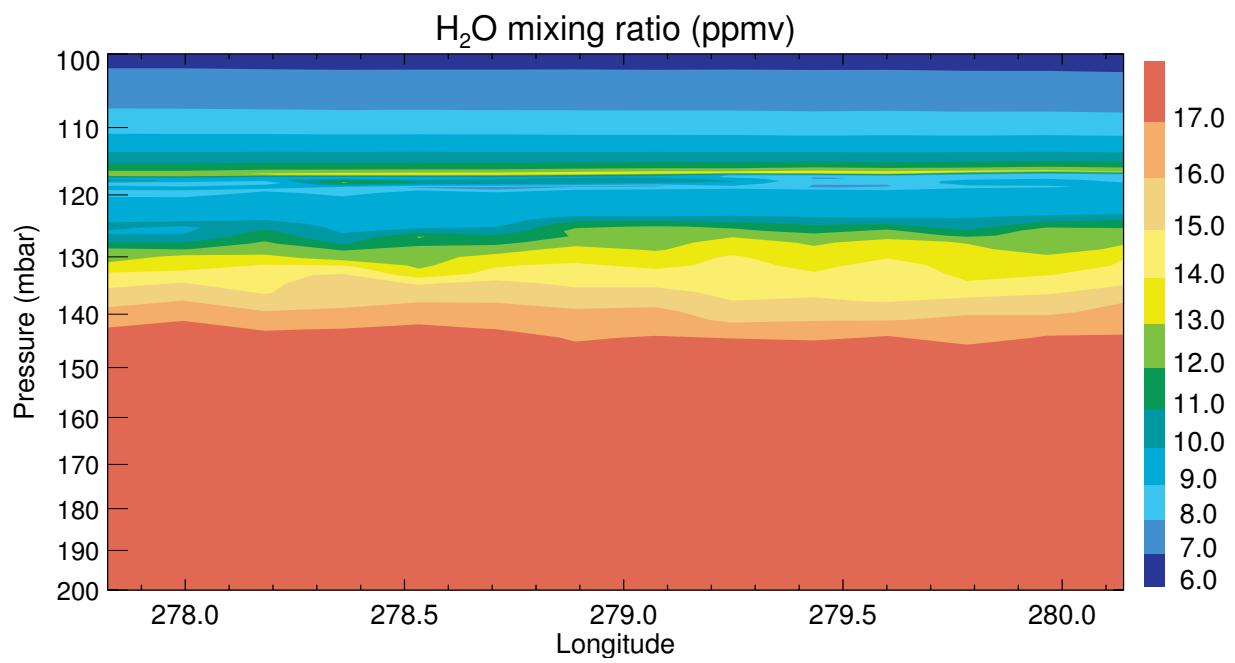
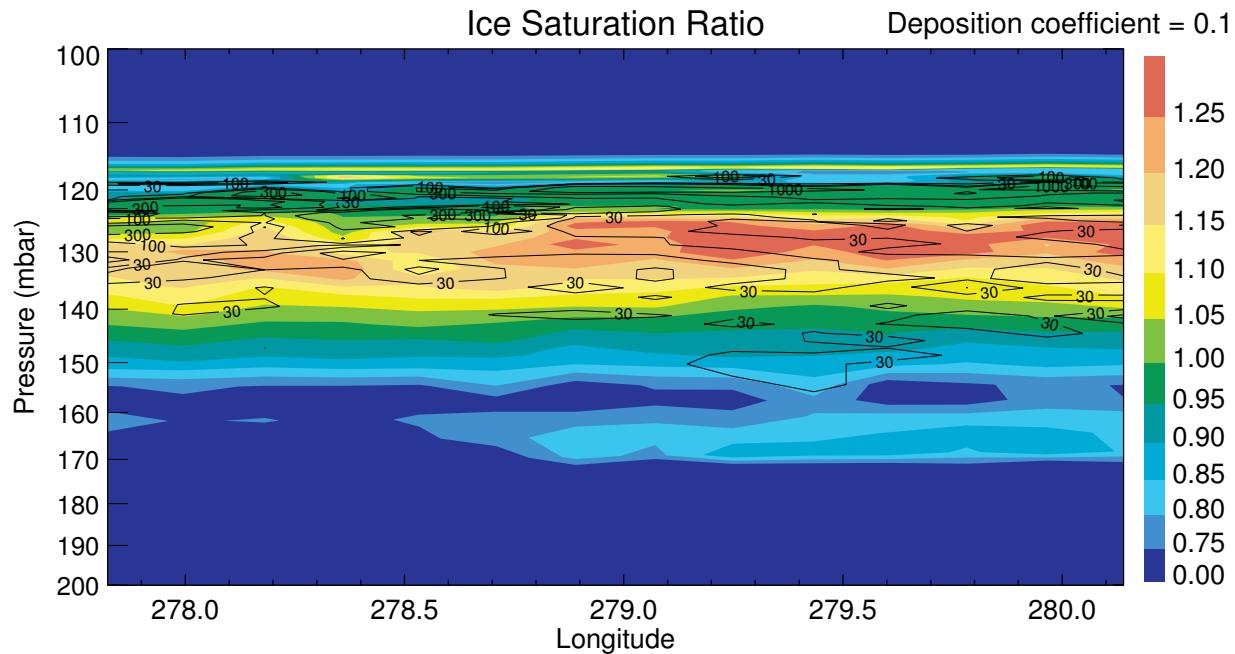


1-D Cloud model simulations using temperature curtain

- Cloud formation is simulated in column of air moving along trajectory
- Thousands of individual ice crystals are tracked

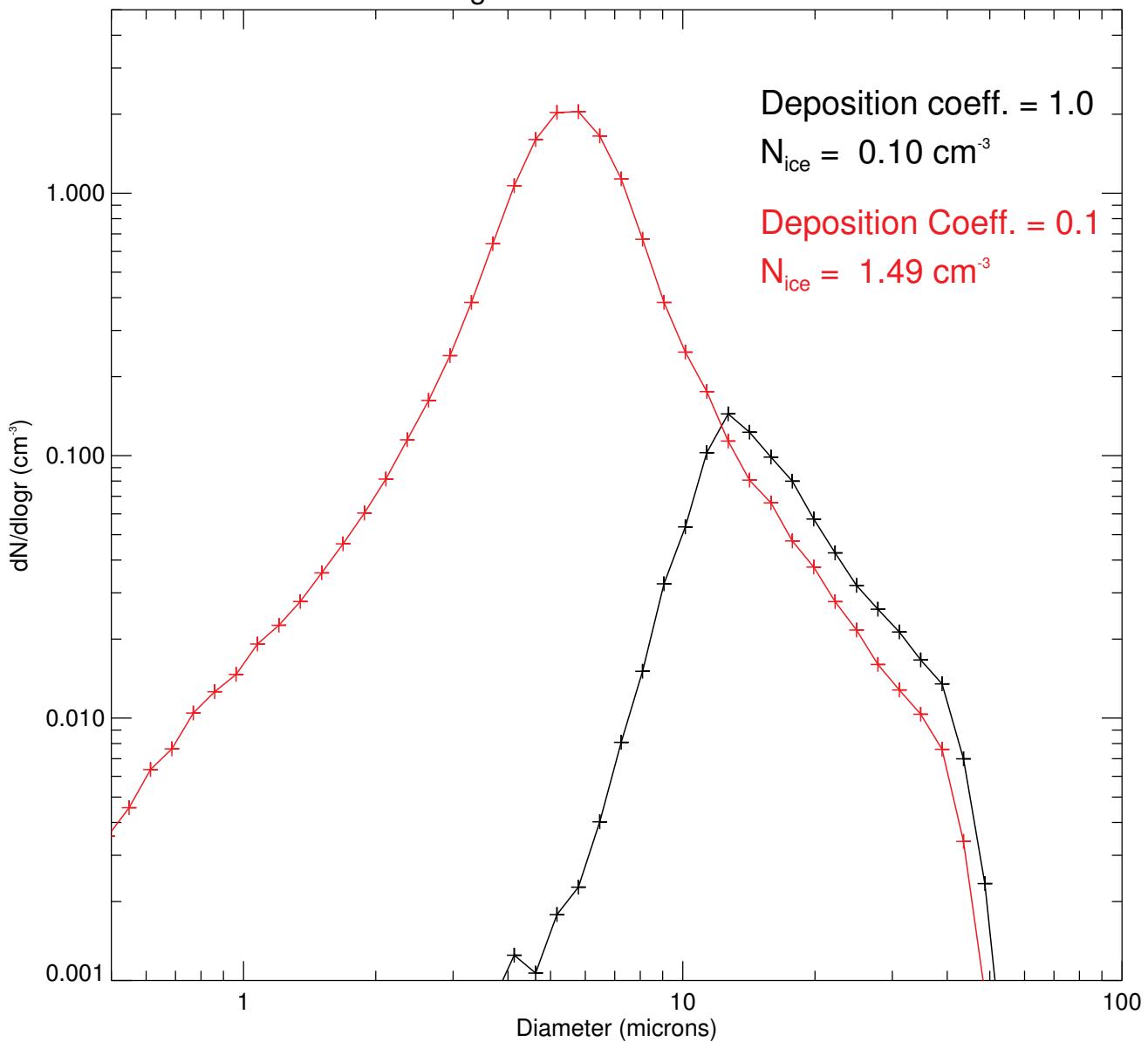


–Patchy cloud, peak surface area < 200 $\mu\text{m}^2/\text{cm}^3$

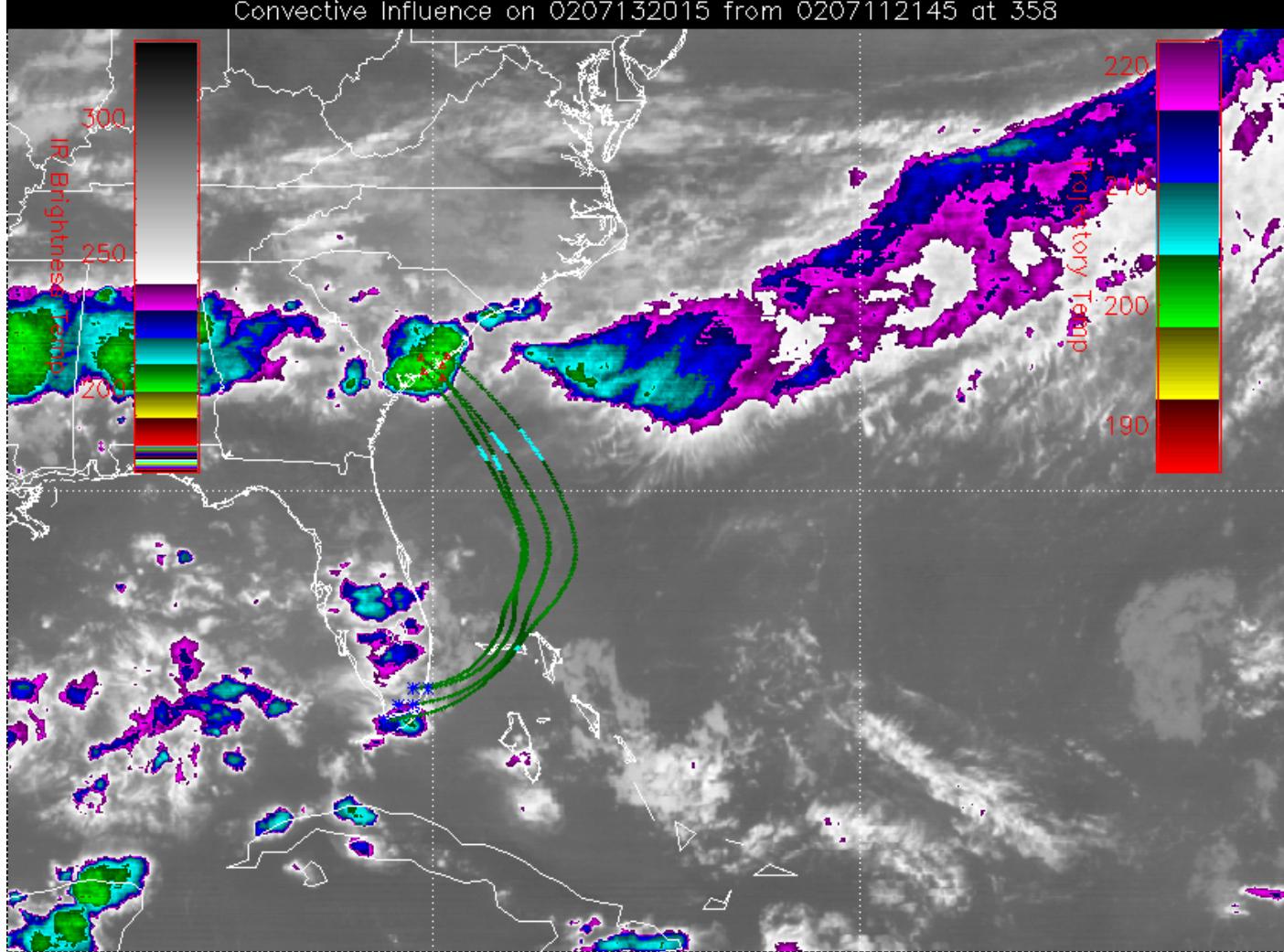


–Thicker cloud, peak surface area > 1000 $\mu\text{m}^2/\text{cm}^2$

Average cloud ice size distribution



Convective Influence on 0207132015 from 0207112145 at 358



Summary

- Cloud layer appears to have formed in situ near the tropopause due to cooling. Convective influence appears to be limited.
- Trajectory/cloud model produces cloud qualitatively similar to the observed cloud.
- Deposition coefficient < 1 may be required to explain observed cloud structure and ice crystal size distributions.

Next Steps

- More systematic tuning of temperature curtains, including GPS profiles, dropsondes, MTP, and gravity waves
- Quantitative comparison between model and in situ cloud measurements
- Analysis of lidar data from Eastern site and MODIS/MAS thin cirrus retrievals
- Analysis of cloud radiative effects